

Group I: Claims 46-61; Group II: Claim 62; Group III: Claims 63-74; and Group IV: Claims 75-78. Applicants elected Group III, Claims 63-74, with traverse.

In the January 23, 2009 Office Action, the Examiner acknowledged Applicants' election and arguments. Nevertheless, the Examiner found that there was no special technical feature in common among Groups I-IV, in view of the prior art, for example Cody et al., US 4,505,888.

Applicants have amended all of the independent claims, Claims 46, 63-69, 75 and 77, to include the limitation that the "iron (II) sulphate-containing precipitate is predominantly iron (II) sulphate monohydrate" or the reducing agent is an "iron (II) sulphate monohydrate-containing precipitate." Support for the amendment is found generally throughout published application US 2007/0039522 A1, and in particular at [0017] / [0018]. Applicants submit that iron (II) sulphate monohydrate possesses unique properties, which leads to a special technical effect in compositions useful for reducing soluble chromate in cement, that is, by chemically reducing Cr (VI) to Cr (III). The special technical effect is discussed in detail below, in response to the rejections entered in the case.

Before addressing the merits of the rejection, however, Applicants note that the Examiner has indicated that Claims 67, 68, and 73-74 have been withdrawn from consideration. Applicants request reconsideration of the withdrawn claims on the ground that the independent claims, from which the withdrawn claims depend, are allowable.

### **Claim Rejections - 35 USC § 103**

**Claims 63-66 were rejected under 35 USC § 103(a) as being unpatentable over Rasmussen (US 4,572,739) and Cody et al. (US 4,505,888).**

The Examiner found that Rasmussen teaches to eliminate or reduce the water-soluble chromate concentration in cement using ferrous sulphate. Cody et al. disclose a process for obtaining iron sulphate by crystallizing (precipitating) iron (II) sulphate from sulfuric acid. Thus, the Examiner finds that it would have been obvious to use the iron (II) sulphate obtained by the process of Cody et al., to reduce the water-soluble chromate concentration in cement, as disclosed by Rasmussen.

For the following reasons, Applicants submit that the claimed precipitate, comprising iron (II) sulphate monohydrate is unique and possesses unexpected advantages, relative to the prior art relied upon by the Examiner, which overcomes a finding of obviousness.

Rasmussen discloses the use of iron (II) sulphate heptahydrate as the reducing agent in cement compositions. (Ex. 1, col. 6, lines 26-28). Thus, Rasmussen does not teach the use of the iron (II) sulphate monohydrate as a composition to reduce the water-soluble chromate concentration in cement.

Cody et al. disclose a process for obtaining iron (II) sulphate precipitate from a solution of sulphuric acid. The process conditions, however, are such that the obtained compound appears to be predominantly  $\text{FeSO}_4 \cdot 7\text{H}_2\text{O}$ , that is, the heptahydrate. (col. 4, lines 15-21).

The Rasmussen and Cody et al. references cannot be combined to arrive at Applicants' invention, because neither of the references discloses a precipitate that is predominantly comprised of iron (II) sulphate monohydrate.

Iron (II) sulphate monohydrate is less soluble in water relative to the heptahydrate. Attention is directed to the article by Dr. Wassing published in *Cement International* 3/2006 (pp. 70-86). A copy of the article is identified as Exhibit B, hereto. "The monohydrate has the lowest rate of dissolving," relative to the heptahydrate and the tetrahydrate. (Wassing p. 72). The slow dissolution rate is associated with a lack of availability of the iron (II) sulphate monohydrate as a reducing agent. Thus, the person of ordinary skill desiring to reduce the water-soluble chromate in cement would be led away from the monohydrate, and would look to the heptahydrate of iron (II) sulphate.

It has generally been observed that the chromate-reducing effect of iron (II) sulphate mixed into the cement decreases over time during storage. US 2007/0039522 A1 at [0009] / [0010]. Applicants note that the prior art EPO publication (EP 160 747 A1) cited in the present application is the counterpart of Rasmussen, US 4,572,739, which discloses the use of iron (II) sulphate heptahydrate.

Iron (II) sulphate monohydrate possesses unexpected advantages relative to iron (II) sulphate heptahydrate in terms of stability. In particular, Applicants identify a reducing effect realized from the use of iron (II) sulphate monohydrate in cement, which

does not decrease over time, and under some circumstances increases over time. (US 2007/0039522 A1 at [0074] and Table 7). The relative stability of the monohydrate is documented in Dr. Wassing's paper, and led to the following conclusion:

*"Iron (II) sulfate monohydrates provide chromate reducers that, because of their lower crystal water content, are less susceptible to passivation and to destruction by oxidation at increased temperatures than the iron (II) sulfates containing high levels of crystal water. As with the tin sulfates this makes it possible to add to them by intergrinding with the cement clinker. The resulting high temperatures produce only an insignificant decrease in their effectiveness in cement." Cement International 3/2006 at p. 86.*

Another advantage of the iron (II) sulphate monohydrate obtainable by concentration of an iron (II) sulphate-containing used sulphuric acid, according to Applicants' disclosure, is the production of a precipitate having a crystallite size and primary particle size that is significantly less than prior art "green salt" (iron (II) sulphate heptahydrate). US 2007/0039522 A1 at [0065] to [0070]. For example, the crystallite size of the monohydrate was found to be 0.3  $\mu\text{m}$  versus  $\gg 3 \mu\text{m}$  for the green salt. The small crystallites of the obtained iron (II) sulphate monohydrate have been found by Applicants to dissolve in water at an effective rate, when the reducing agent is used in cement. Thus, the relatively small crystallite size of the obtained iron (II) sulphate monohydrate helps to overcome a drawback associated with the monohydrate, that is, its slower dissolution rate relative to the heptahydrate.

Yet another advantage of employing the iron (II) sulphate monohydrate is that the precipitate may be washed with steam to remove impurities, and only very little iron (II) sulphate monohydrate is dissolved. (US 2007/0039522 A1 at [0035] to [0042]).

In sum, Rasmussen and Cody et al. cannot be combined to arrive at the claimed invention, as amended, because neither reference discloses the iron (II) sulphate monohydrate. Thus, the cited references do not create a *prima facie* case of obviousness. Furthermore, the unexpected advantages of the iron (II) sulphate monohydrate, namely the storage stability when the compound is used as a reducing agent in cement, rebuts a finding of obviousness.

**Claims 69-72 were rejected under 35 USC § 103(a) as being unpatentable over Rasmussen.**

The Examiner found that Rasmussen teaches the use of iron (II) sulphate heptahydrate as a reducing agent in cement, including mixing the reducing agent with the cement, prior to packaging, bulk storage, etc. Further, the Examiner found that the product-by-process claims did not exclude the iron (II) sulphate disclosed by Rasmussen.

Applicants note that Claim 69 now includes the limitation that the iron (II) sulphate-containing precipitate is predominantly iron (II) sulphate monohydrate. Accordingly, Applicants have clearly distinguished the composition of the claimed invention from the reducing agent of Rasmussen. Further, Applicants submit that the method of Claims 69-72, incorporating iron (II) sulphate monohydrate, is not obvious for the reasons stated above.

Applicants request reconsideration of the restriction requirement, in view of the claim amendments establishing a special technical effect that all of the Group I-IV claims now have in common, that is, the use of iron (II) sulphate monohydrate in the reducing agent composition.

Applicants submit that the application is in condition for allowance, and respectfully requests the same.

Sincerely,



Timothy J. Monahan  
Registration No. 32,481  
USPTO Customer No. 52,554  
Attorney for Applicant

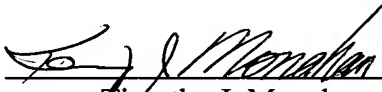
July 21, 2009  
DATE

Monahan & Moses, LLC  
13-B West Washington Street  
Greenville, South Carolina 29601  
Telephone: (864) 241-4604  
Facsimile: (864) 241-4606  
[tim.monahan@momolaw.com](mailto:tim.monahan@momolaw.com)

## CERTIFICATE OF MAILING

I hereby certify that the following correspondence is being deposited with the United States Postal Service as first class mail in an envelope addressed to Mail Stop Amendment, Commissioner for Patents, Post Office Box 1450, Alexandria, Virginia 22313-1450, on July 21, 2009, along with a postcard receipt.

- Response to Office Action and Amendment;
- Exhibit A;
- Exhibit B;
- Petition for Extension of Time;
- Extension of Time Fee – Check no. 1393
- Return Receipt Postcard.

  
\_\_\_\_\_  
Timothy J. Monahan